Identification document comprising a two-dimensional barcode

The present invention relates to an identification document of the type including:

- a physical substrate bearing at least one alphabetical inscription for identifying the bearer of the document, and
- at least one two-dimensional barcode for identifying the bearer of the document,

It is known how to provide, on one face of identification documents, such as identity cards, driving licenses or passports, a barcode notably a two-dimensional barcode, such as a QR Code. This QR Code includes identification data, such as biometric information or civil registration information of the person.

The two-dimensional barcodes or matrix codes are generally square matrices with black and white dots.

The dot density depends on the amount of information which has to be stored.

In order to store a large amount of information, the use of a QR Code including many points is known.

Increasing the amount of stored information increases the area occupied by the QR Code square on the document and makes it all the more difficult to read.

The object of the invention is to propose an identity document including a two-dimensional barcode for storing data which allows the encoding of a very large volume of data while allowing simple legibility of the identification document.

For this purpose, the object of the invention is an identification document of the aforementioned type, characterized in that it includes at least two two-dimensional barcodes on which are encoded complementary portions of a same file for identifying the bearer of the document.

According to particular embodiments, the identification document includes one or several of the following features:

- the two-dimensional barcodes are aligned so as to form an area with a rectangular shape,
- the two-dimensional barcodes are separated by spaces free of any marking, with a width comprised between 1 and 5 mm,
- the two-dimensional barcodes are in a number comprised between 2 and 6,
- the data encoded in the two-dimensional barcodes are civil registration information and biometric information, and
- both two-dimensional barcodes are of identical format.

An object of the invention is also a method for manufacturing an identification document as defined above including the steps of:

- collecting pieces of identification information,

- encoding these pieces of identification information on at least one two-dimensional barcode, and
- printing said at least one two-dimensional barcode, characterizing that:
- after collecting the identification information, the step for agglomerating the pieces of identification information in a single file,
- cutting the file in at least two mating portions each with a size compatible with the encoding on a single two-dimensional barcode,
- encoding on a single two-dimensional barcode a same format of each mating portion, and
- printing said at least two two-dimensional barcodes with identical formats on a same substrate.

According to particular embodiments, the method includes one or several of the following features:

- the step for agglomerating pieces of information in a single file comprises a step for forming a native file containing the pieces of identification information and a step for encrypting the native file in order to form an encoded file, and the cutting-out step comprises the step for cutting out the encoded file.

The object of the invention is also a method for reading an identification document as defined above including:

- reading each two-dimensional barcode,
- decoding each two-dimensional barcode,
- agglomerating the decoded pieces of information in said at least two two-dimensional barcodes in order to form a single file, and
- extracting identification information from the single file.

According to particular embodiments, the reading method includes one or several of the following features:

- during the step for agglomerating the decoded pieces of information, a step for forming an encrypted single file grouping the decoded pieces of information and a step for decrypting the encrypted single file for forming a native identification file and the step for extracting the pieces of identification information is carried out on the native identification file.

The invention will be better understood upon reading the description which follows, only given as an example and made with reference to the drawings wherein:

- Fig. 1 is a view of both faces placed side by side of a same identification document according to the invention;

- Fig. 2 is a schematic view of a facility for manufacturing an identification document according to the invention;

- Fig. 3 is a view of a flow chart of the method for processing the data during the manufacturing of an identification document according to the invention;

- Fig. 4 is a schematic view of a facility for reading an identification document according to the invention; and

- Fig. 5 is a view of a flow chart of the identification method applied by the facility of Fig. 4.

In Fig. 1 are illustrated both faces 10A, 10B of a same identification document 12 for example forming a national identity card.

The card 12 includes a rectangular substrate such as a cardboard or polymeric sheet. Preferably, this substrate is of a rectangular shape.

One or several electronic chips with or without any contact are integrated into this substrate. Alternatively, no electronic chip is integrated into the substrate.

Each of the two faces of the card is printed. The front face 10A for example includes a photograph 14 of the bearer as well as civil registration information 16 written in printed letters. These pieces of information are for example the name, the first name, the date of birth, the nationality of the bearer, etc.

The back of the card 10B includes other pieces of information relating to the bearer such as his/her address 18. The address is indicated in the form of printed characters.

According to the invention, one of the faces of the card, and notably the back 10B, includes at least two two-dimensional barcodes 20 of same formats positioned in a line side by side, thus covering a rectangular area 22. This area 22 preferably extends parallel to one of the edges of the card, and notably the longest edge of the card.

Each two-dimensional barcode 20 is of a square shape. These codes are spaced apart by an interval 24, the width of which is comprised between 1 and 5 mm and preferably substantially equal to 2 mm. This interval 24 forms a space free of any marking.

The two-dimensional barcodes are aligned so that their contiguous sides extend parallel to each other and the sides neighboring the contiguous sides extend in the extension of each other.

All the QR Codes are oriented in the same way.

The length of a side of a two-dimensional barcode is comprised between 1 and 3 cm.

In the illustrated embodiment, the number of two-dimensional barcodes is 4. It is preferably comprised between 2 and 6.

Each two-dimensional barcode is for example a QR Code from Denso.

The QR Code preferably has a maximum capacity of 2,953 bytes and includes 177 x 177 dots. This QR Code for example observes the ISO/IEC18004 standard.

The information contained in these QR Codes consists of civil registration information on the one hand and of biometric data, on the other hand, such as a photograph, fingerprints, or one or two irises.

The facility 28 illustrated in Fig. 2 is capable of manufacturing identification documents according to the invention and more specifically capable of forming and printing two-dimensional barcodes.

This facility 28 includes a central information processing unit 30 for example formed with a micro-computer forming a terminal connected to a network 32. This terminal includes a screen 34 and a keyboard 36 allowing input of information, notably relating to the civil identity of the person currently designated as a « bearer » for whom the identification document is made.

The terminal 30 is connected through the network 32 to a central database 38 capable of storing in memory for each person pieces of information relating to his/her civil registration, as well as biometric information such as his/her photograph, his/her fingerprints or his/her iris. This base further includes security information relating to this person and for example indicating whether he/she is wanted and/or if he/she has been forbidden to enter certain territories.

The terminal 30 is connected to readers of biometric information on the person such as a camera 40 giving the possibility of taking photographs or images of the iris as well as a scanner 42 able to capture a digital representation of the fingerprints of the person.

Finally, the installation 28 includes a printer 44 connected to the terminal 30 and able to ensure the printing, under its command, of several two-dimensional barcodes 20 aligned on an identification card 12.

The terminal 30 applies a set of programs for controlling the biometric readers 40, 42, for the encoding and storage of civil registration and biometric information in the base 38 and finally for controlling the printer 44 for printing the aligned two-dimensional barcodes.

These programs further ensure collection, from the keyboard 36, of pieces of civil registration information relating to each person wishing to have an identification document.

The whole of these programs applies a method as illustrated in Fig. 3.

In step 100, the civil registration of the person is collected by the terminal 30 by means of an input to the keyboard 36.

A photograph of the person is made from the camera 40 and temporarily stored in the terminal 30. Also, several fingerprints, notably for example of four fingers in an amount of two per hand, are collected from the scanner 42.

At the end of the collection of the civil registration and biometric information, this information is stored in the database 38 in step 101 by transmitting pieces of information optionally reformatted by the terminal 30.

The whole of this information is organized in a file CF_{ID} according to a predefined format containing the concatenated data of the civil registration information and of the collected biometric information, to which are added a header and other technical data.

The thereby formed file CF_{ID} is then encrypted during a step 104 in order to guarantee its integrity and also guarantee its authenticity.

For this purpose, an asymmetrical algorithm notably of the RSA type is used. Such an algorithm is known *per se* and implements a private key which is kept in the facility 28 without being made available in the identification document or in the facilities for reading this identification document.

The asymmetrical algorithm of the RSA type used applies a private key of at least 1,024 bits and preferably substantially equal to 1,024 bits. The algorithm is such that all the data are encoded with the RSA algorithm, without any loss of capacity.

At the end of the encryption, the thereby obtained file noted as F_{ID} is partitioned into four elements noted as F_{ID}^{i} in step 106. Each elementary file F_{ID}^{i} is obtained by cutting the file F_{ID} into four sub-files of identical size, the concatenation of which gives the encrypted file F_{ID}.

In step 108, a piece of information ordering the elementary files F_{ID}^{i} is added into one or several elementary files for allowing their subsequent concatenation in the order of the initial partitioning.

For example, the partitioning element added at the beginning of each elementary file is a letter a, b, c... according to the lexicographic order and corresponding to the partitioning order of the elementary files.

Thus, a completed elementary file a+ F_{ID}^{1} is obtained by concatenation of the letter a and of the elementary file F_{ID}^{1}.

Also, a completed elementary file b+ F_{ID}^{2} is obtained as a second file by adding the letter b to the beginning of the elementary file F_{ID}^{2}.

More generally, each completed elementary file is written in the form of e_i+ F_{ID}^{i} wherein e_i is a header corresponding to the rank i from a set of ordered headers $\{e_1, e_2..., e_i..., e_n\}$ and F_{ID}^{i} is the i^{th} elementary file obtained during the partitioning of the file CF_{ID}.

Advantageously, for all the identification documents of a same set of persons, for example the nationals of a same country, the pieces of ordering information e_i are identical for all the documents for the barcodes including complementary portions F_{ID}^i of same rank of the identification file corresponding to the document.

Each complementary elementary file $e_i + F_{ID}^i$ is transformed into a graphic element according to the QR Code standard in step 110, i.e. each completed elementary file $e_i + F_{ID}^i$ is transformed into a matrix of two-tone dots.

In step 112, the printer 44 is controlled by the terminal 30 in order to ensure the printing of the two-dimensional codes aligned in the area 22 of an identification document blank on which the other pieces of information have been printed beforehand or are then printed simultaneously or subsequently.

In Fig. 4, is illustrated a facility 200 for identifying a bearer of an identification document.

This facility for example includes a reader of two-dimensional barcodes 202. This reader is formed for example with a mobile telephone equipped with a camera and a suitable reading software package. This read software package is adapted for ensuring the detection of several aligned two-dimensional codes and for ensuring individual reading of each of them.

The facility further includes a terminal 204 connected to the database 38 as well as to the reading device 202, for example through a wireless connection of the WiFi type 206.

A scanner 210 for fingerprints is also connected to the terminal 204.

The terminal 204 is capable of comparing the civil registration and biometric information obtained by the reader 202 and of comparing the latter with the information contained in the base 38 in order to make available to the user of the terminal 204 a piece of information on the bearer of the identification document.

Programs applied in the reader 202 or in the terminal 204 are used for applying the algorithm illustrated in Fig. 5.

Alternatively, the reader 202 is directly connected to the database 38 and includes information processing means capable of applying the programs applied in the terminal 204, which then does not exist.

Initially, and as illustrated in Fig. 5, the reader 202 ensures in step 302 reading of the whole of the aligned two-dimensional barcodes.

In step 304, it ensures individualization of each two-dimensional barcode. This individualization is facilitated by the presence of white lines forming the intervals between each of the aligned barcodes.

For each thereby identified barcode, the reader 202 determines the completed crude data $e_i+F_{ID}^i$ contained in each two-dimensional barcode. In step 307, the crude data F_{ID}^i are isolated by suppressing the ordering e_i located at the beginning and then in step 308, a reconstruction of the complete crude data is carried out, by associating by concatenation each of the files F_{ID}^i according to the order defined by the ordering headers e_i for reconstructing a file F_{ID}.

This file F_{ID} is transmitted to the terminal 204 in the contemplated embodiment.

The computer of the terminal 204 ensures in step 310 the decryption of the file for reconstructing the file CF_{ID}, and then checked in step 312 the integrity of the file by means of an algorithm known *per se*.

In step 314, the terminal 204 extracts from the file F_{ID} the data which are contained therein by suppressing the headers and other technical data.

In the foregoing, the term of file may refer to a data structure containing pieces of information handled in the processing flow without however being temporarily or definitively stored on a storage medium.

The civil registration information, the photograph and the four fingerprints (or the number of fingerprints appearing therein) are stored in memory in the terminal 204.

In step 316, the civil registration information as well as the identity photograph are displayed on the screen of the terminal 204.

In step 318, a connection is carried out towards the base 38 in order to collect security information on the person, the civil registration data of which has been revealed by the identification document. These security data are sent back by the database 38 and made available on the screen of the terminal 204. These pieces of safety information are for example a piece of information authorizing entry on the territory or on the contrary an identification for prohibiting entry of a territory.

Simultaneously, an acquisition of the fingerprints of the bearer of the identification document is carried out by the reader 210 in step 320 and transmitted to the terminal 304. A comparison is carried out in the terminal 204 between the measured imprints and the imprints stored in memory in the identification document in step 322. The result of this comparison as well as the safety data transmitted by the database 38 are displayed in step 324 and made available to the user of the terminal so that the latter may apply the procedures for treating the bearer of the identification document.

CLAIMS

1. An identification document (12) including:
- a physical substrate bearing at least one alphabetical inscription for identifying the bearer of the document, and
- at least one two-dimensional barcode (20) for identifying the bearer of the document,
characterized in that it includes at least two two-dimensional QRCode barcodes (20) on which are encoded complementary portions (IF_{ID}^{i}) of a same identification file (IF_{ID}) of the bearer of the document.

2. The document according to claim 1, characterized in that the two-dimensional QRCode barcodes (20) are aligned in order to form an area (22) of rectangular shape.

3. The document according to claim 1 or 2, characterized in that the two-dimensional QRCode barcodes (20) are separated by spaces free of any marking (24), with a width comprised between 1 and 5 mm.

4. The document according to any of the preceding claims, characterized in that the two-dimensional QRCode barcodes (20) are in a number comprised between 2 and 6.

5. The document according to any of the preceding claims, characterized in that the data encoded in the two-dimensional QRCode barcodes (20) are pieces of civil registration information and pieces of biometric information.

6. The document according to any of the preceding claims, characterized in that both two-dimensional QRCode barcodes (20) are of identical format.

7. The document according to any of the preceding claims, characterized in that each two-dimensional QRCode barcode includes a piece of ordering information (e_i) and a portion (IF_{ID}^{i}) of the identification file, which ordering information (e_i) is representative of the order of the complementary portions (IF_{ID}^{i}) in the identification file (IF_{ID}^{i}).

8. The whole of documents according to claim 7, characterized in that the pieces of ordering information (e_i) are identical for all the documents for barcodes including complementary portions (F_{ID}^{i}) of the same rank of the identification file corresponding to the document.